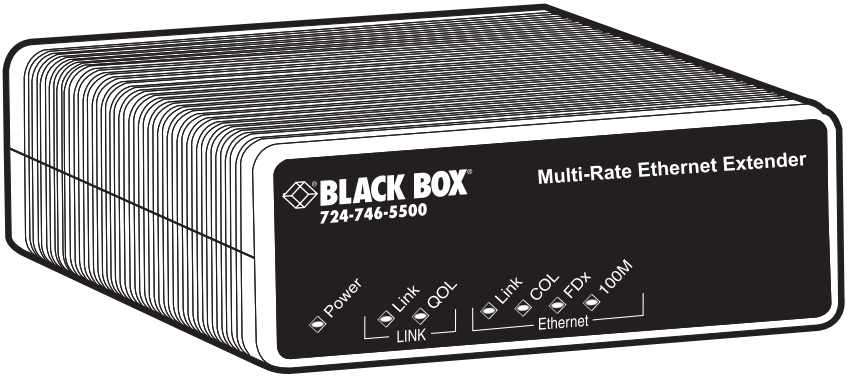
BLACK BOX®
NETWORK SERVICES

DECEMBER 2006
LB200A

Multi-Rate Ethernet Extender



CUSTOMER SUPPORT INFORMATION Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: www.blackbox.com • E-mail: info@blackbox.com

CE NOTICE

The CE symbol on your Black Box equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

RADIO AND TV INTERFERENCE

The Multi-Rate Ethernet Extender generates and uses radio frequency energy, and if not installed and used properly-that is, in strict accordance with the manufacturer's instructions-may cause interference to radio and television reception. The Multi-Rate Ethernet Extender has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Ethernet Extender does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

WARNING

• This device contains no user serviceable parts. The equipment shall be returned to Black Box for repairs, or repaired by qualified service personnel.

• The external power adapter should be a listed Limited Power Source. Ensure that the power cable used meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground. The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker.

• Do not work on the system or connect or disconnect cables during periods of lightning activity.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

TRADEMARKS USED IN THIS MANUAL

All applied-for and registered trademarks are the property of their respective owners.

NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT

Instrucciones De Seguridad

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
    A. El cable de poder o el contacto ha sido dañado; u
    B. Objectos han caído o líquido ha sido derramado dentro del aparato; o
    C. El aparato ha sido expuesto a la lluvia; o
    D. El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    E. El aparato ha sido tirado o su cubierta ha sido dañada.

CONTENTS

CE Notice 2

Radio and TV Interference 2

Trademarks Used In This Manual 3

Normas Oficiales Mexicanas (NOM) Electrical Safety Statement 3

1. General Information 7
   - 1.1 Features 7
   - 1.2 Description 7

2. Installation 9
   - 2.1 Installing the Multi-Rate Ethernet Extender 9
   - 2.2 Connecting the Twisted-Pair Line Interface 10
   - 2.3 Connecting the 10/100Base-T Ethernet Interface 11
   - 2.4 Connecting Power 12

3. Configuration 13
   - 3.1 Configuring DIP Switch S1 14
     - 3.1.1 Switch S1-1: Ethernet Auto Sense 14
     - 3.1.2 Switches S1-2 Through S1-4: Data Rate 15

4. Operation 16
   - 4.1 Power Up 16
   - 4.2 Front Panel LED Status Monitors 16

A. Specifications 18
   - A.1 LAN Connection 18
   - A.2 Transmission Line 18
   - A.3 Multi-Rate Ethernet Extender Line Rate 18
   - A.4 Multi-Rate Ethernet Extender Distance 18
   - A.5 Line Surge Suppressor 18
   - A.6 LED Status Indicators 18
   - A.7 Power Supply 19
   - A.8 Temperature Range 19
   - A.9 Humidity 19
   - A.10 Dimensions 19

B. Multi-Rate Ethernet Extender Interface Pin Assignment 20

B.1 10/100Base-T Interface 20
B.2 Line Interface 20

C. Distance Chart, Based on 24 AWG (0.5 MM) 21

1. General Information

Thank you for your purchase of this Black Box product. If any questions arise during installation or use of the unit, contact Black Box Tech Support at (724) 746-5500.

1.1 Features

- Easy to install standalone Multi-Rate Ethernet Extenders—*no configuration required*
- Auto-MDIX Ethernet
- Auto-sensing full or half-duplex Ethernet
- Auto-sensing 10/100Base-T
- Extends network connections up to 6,000 ft (1.83 km) over 2-wire 24-AWG unconditioned lines
- Switch selectable line rates up to 16.67 Mbps
- 7 symmetric or asymmetric settings via DIP switch
- Transparent operation
- LED indicators for Power, Ethernet Link & Activity, Line Link & Quality of Line (QOL)
- Surge suppression up to 20 kA (8/20 µs)
- Available in rack-mount or standalone configurations
- Made in the USA

1.2 Description

The Multi-Rate Ethernet Extender/L (Local) and Multi-Rate Ethernet Extender/R (Remote) provide high speed LAN connections between peered Ethernet LANs, remote PC's, or any other network enabled 10/100Base-T device.

Operating in pairs, a Multi-Rate Ethernet Extender/L (Local) located at one end of the LAN extension and a Multi-Rate Ethernet Extender/R (Remote) at the other end, these units can automatically forward LAN broadcasts, multicasts, and frames across a 2-wire voice-grade twisted-pair link. The data is passed transpar-

ently (unmodified) through the Multi-Rate Ethernet Extenders. The Ethernet Extenders automatically add and delete MAC addresses, only passing packets across the link that are meant for the remote peered LAN.

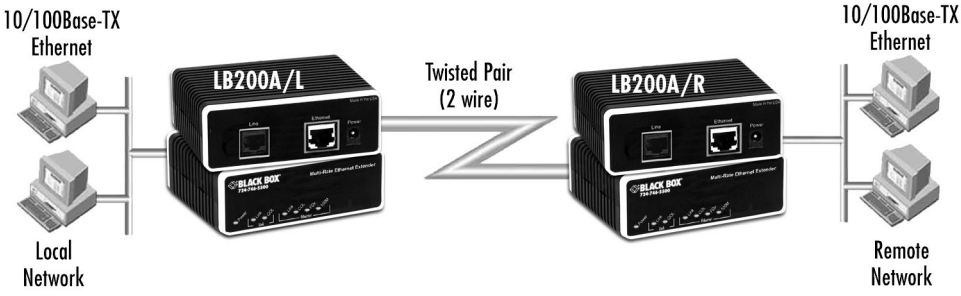


Figure 1. Typical application

The Local and Remote Multi-Rate Ethernet Extenders work together to create a transparent extension between two peered Ethernet LANs. Figure 1 shows a typical point-to-point application.

2. Installation

Because the LB200A requires no configuration, it can be installed quickly.

Note If asymmetric transmission or line rates other than 12.5 Mbps are required, refer to section 3., “Configuration” on page 13.

2.1 Installing the Multi-Rate Ethernet Extender

Do the following:

1. Connect the line interface between the units (refer to section 2.2, “Connecting the Twisted-Pair Line Interface” on page 10)

   Note See Figure 2 for the standalone unit’s rear panel arrangements.

2. Connect the Ethernet interface (refer to section 2.3, “Connecting the 10/100Base-T Ethernet Interface” on page 11).

3. Connect the power plug (refer to section 2.4, “Connecting Power” on page 12).

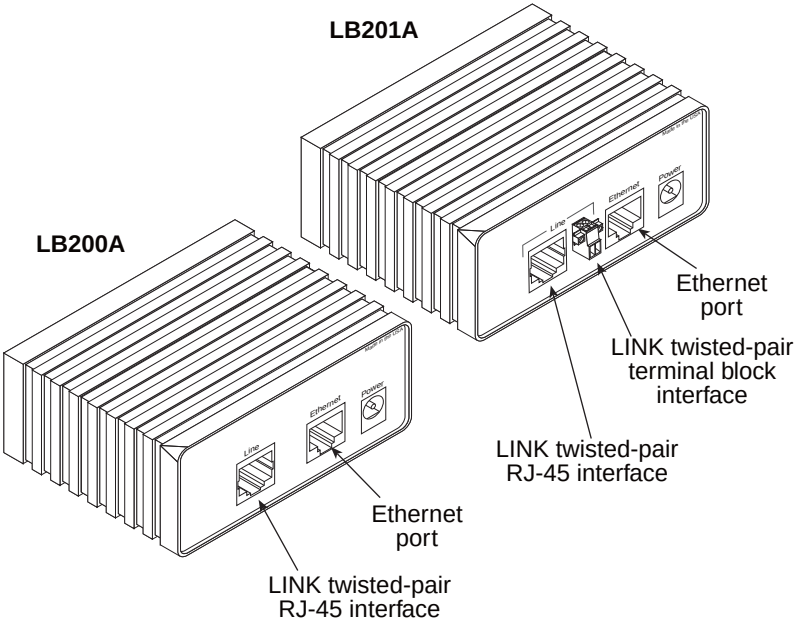


Figure 2. Multi-Rate Ethernet Extender standalone rear panel

2.2 Connecting the Twisted-Pair Line Interface

The Multi-Rate Ethernet Extender supports communication between two peer Ethernet LAN sites over a distance of up to 6,000 ft (1.83 km) over 24 AWG (0.5 mm) twisted-pair wire.

Note Actual distance and link performance may vary depending on the environment and type/gauge of wire used.

Follow the steps below to connect the Ethernet Extender interfaces.

Note The Ethernet Extender units work in pairs. One of the units must be a L (Local), and the other unit must be a R (Remote). It does not matter which end is the L and which is the R. The link is always initiated by the Remote. As long as the Local is powered on, the Remote can establish a link by being powered on or by having its power reset.

1. To function properly, the two Ethernet Extenders must be connected together using twisted-pair, unconditioned, dry, metal wire, between 19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.

2. The Ethernet Extender is equipped with the LINK interface presented on an RJ-45. This *LINK* interface is a two-wire interface. Observe the signal/pin relationships on the *LINK* interface jack. For a terminal block *LINK* interface (LB201A), please contact info@blackbox.com.

The RJ-45 connector on the Ethernet Extender's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in Figure 3.

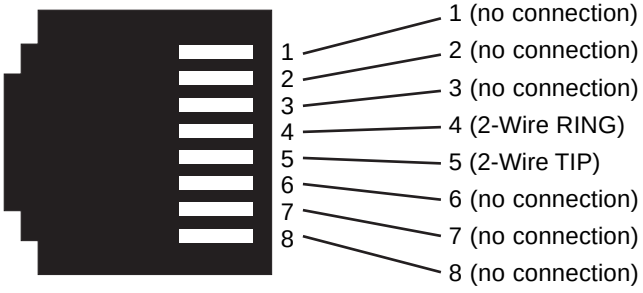


Figure 3. Line Driver (RJ-45) twisted pair line interface.

2.3 Connecting the 10/100Base-T Ethernet Interface

The unshielded RJ-45 port labeled *Ethernet* is the Auto-MDIX 10/100Base-T interface. This port is designed to connect directly to a 10/100Base-T network. Figure 4 shows the signal/pin relationships on this interface. You may connect this port to a hub or PC using a straight through or crossover cable that is up to 328 ft long.

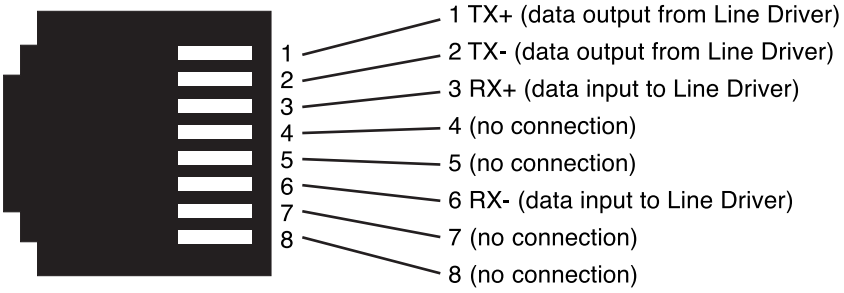


Figure 4. Ethernet Extender 10/100Base-T RJ-45 Connector Pinout.

2.4 Connecting Power

An external AC or DC power supply is available separately. This connection is made via the barrel jack on the rear panel of the Ethernet Extender. No configuration is necessary for the power supply (See Appendix A for domestic and international power supply and cord options).

DC power (supplied via the power supply jack to the Ethernet Extender) must meet the following requirements; DC power supplied must be regulated +5VDC ±5%, 1.0A minimum. Center pin is +5V. The barrel type plug has a 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

- Connect the equipment to a 5 VDC supply source that is electrically isolated from the AC source. The 5 VDC source must be reliably connected to earth.

- An approved external SELV source—rated a maximum of 5 VDC, 2 A—that incorporates a disconnect device must be used and positioned within easy reach of the operator's position.

The Ethernet Extender does not have a power switch, so it powers up as soon as it is plugged in.

WARNING

There are no user-serviceable parts in the LB200A modem. Fuse replacement should only be performed by qualified service personnel. Contact Black Box Technical support at (724) 746-5500 for more information.

3. Configuration

The Multi-Rate Ethernet Extender has eight DIP switches for configuring the unit for a wide variety of applications. This section describes switch locations and explains the different configurations.

Using a small flat-tip screwdriver, remove the protective cover located on the underside of the Ethernet Extender (see Figure 5).

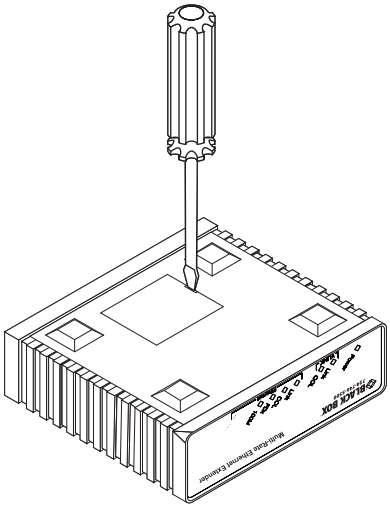


Figure 5. Removing protective cover

Figure 6 shows the orientation of the DIP switches in the On and Off positions.

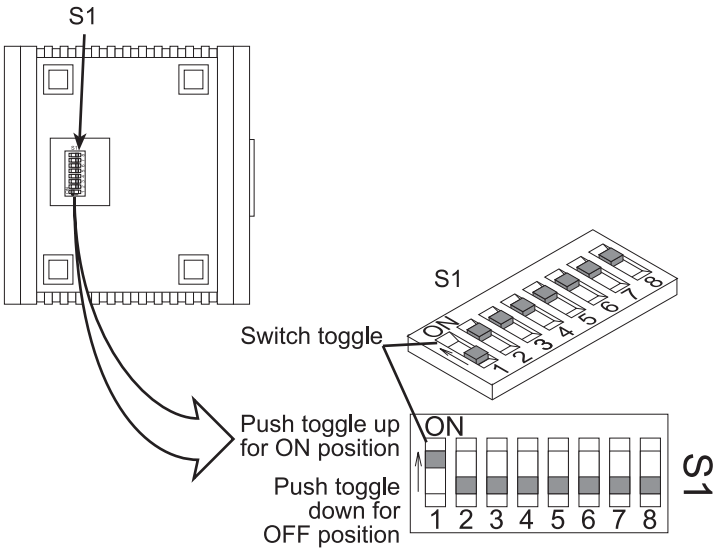


Figure 6. DIP switch orientation

3.1 Configuring DIP Switch S1

DIP switch S1 is where you configure the Link line rate, symmetric or asymmetric, Ethernet full auto negotiation capability (100Base-T full or half duplex, 10Base-T full or half duplex) or limited auto sense (only 100Base-T half duplex, 10Base-T full or half duplex).

3.1.1 Switch S1-1: Ethernet Auto Sense

Use switch S1-1 to configure the unit for full auto sense capability or limited auto sense capability. Full Auto sense capability consists of standard Ethernet Auto sensing (100BaseT full duplex, 100BaseT half duplex, 10BaseT full duplex, and 10BaseT half duplex). Limited Auto sensing capability consists on only auto sensing for 100BaseT half duplex, 10BaseT full duplex, and 10BaseT half duplex. The limited auto negotiation feature is used when an Ethernet device

does not comply with IEEE 802.3x (back pressure flow control) at 100M full duplex.

Table 1: Ethernet Auto Negotiation Selection Chart

S1-1	Setting
OFF	Full Auto Negotiation (Factory Default) (100 Mbps, Full or Half Duplex) (10 Mbps, Full or Half Duplex)
ON	Limited Auto Negotiation (100 Mbps Half Duplex) 10 Mbps Full or Half Duplex)

3.1.2 SWITCHES S1-2 THROUGH S1-4: DATA RATE

Use switches S1-2 through S1-4 to configure the Ethernet Extender's line rates.

Table 2: Symmetric Line Rates Selection Chart

S1-2	S1-3	S1-4	Symmetric Line Rate
ON	ON	ON	6.25 Mbps
ON	ON	OFF	9.38 Mbps
ON	OFF	OFF	12.5 Mbps (Factory Default)
ON	OFF	ON	16.67 Mbps

Table 3: Asymmetric Line Rates Selection Chart

S1-2	S1-3	S1-4	Asymmetric Line Rates DS/US*
OFF	OFF	ON	4.17 Mbps/1.56 Mbps
OFF	ON	ON	9.38 Mbps/1.56 Mbps
OFF	ON	OFF	16.67 Mbps/2.34 Mbps

*. DS = downstream, US = upstream

Table 4: Reserved for future use

S1-5	S1-6	S1-7	S1-8	Reserved for future use
OFF	OFF	OFF	OFF	Reserved (Factory Default)

4. Operation

Once the Multi-Rate Ethernet Extenders are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

4.1 Power Up

Before applying power to the Ethernet Extender, review section 2.4, "Connecting Power" on page 12 to verify that the unit is connected to the appropriate power source.

WARNING

There are no user-serviceable parts in the LB200A modem. Fuse replacement should only be performed by qualified service personnel. Contact Black Box Technical support at (724) 746-5500 for more information.

4.2 Front Panel LED Status Monitors

The Ethernet Extender features five front panel LEDs that monitor power, the Ethernet signals, and the DSL connection. Figure 7 on page 16 shows the front panel location of each LED. Table 5 on page 17 describes the LED functions.

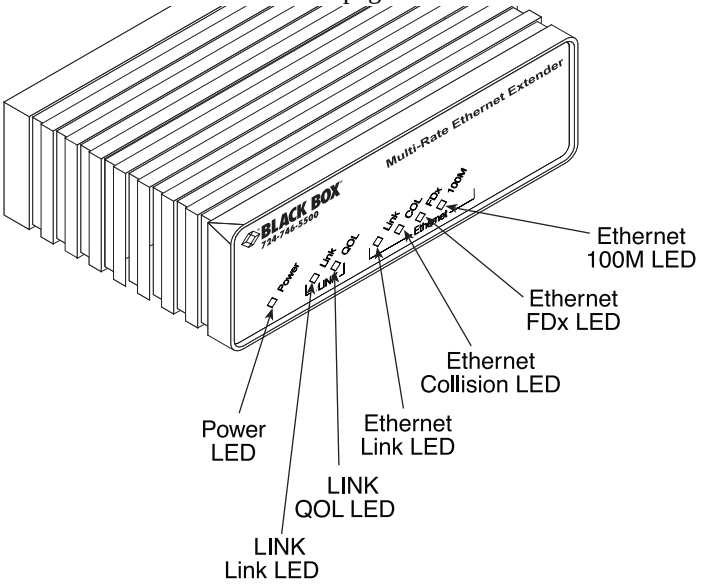


Figure 7. Ethernet Extender front panel

Table 5: Front panel LED description

LED	Description
Power	**On (green)** when power is applied to the unit. **Off** when no power is applied to the unit.
Link	**On (green)** when the end-to-end link between the units is established. **Off** when the link has not been established or when the link fails.
QOL	**Flashes yellow** at different rates to indicate the amount of error correction taking place on data passing over the link. This is a normal operating condition and all data is passing correctly over the link even if the link is **solidly yellow.** However, if the LED is **solid yellow** and the LINK **Link LED is Off**, **Off** when no power is applied to the unit.
Ethernet Link	**On (green)** when the 10/100Base-T Ethernet link has been established. **Off** when the 10/100Base-T Ethernet link has not been established or when the link fails. Flashes when there is Ethernet activity.
Ethernet - COL (Collision)	**Flashes yellow** to indicate Ethernet collisions are occurring.
Ethernet - FDx (Duplex)	**On (yellow)** when in full-duplex Ethernet mode. **Off** when when operating in half-duplex Ethernet mode.
Ethernet - 100M	**On (yellow)** when the link has not been established or when operating in 100-Mbps Ethernet mode. **Off** when operating in 10-Mbps Ethernet mode.

A. Specifications

A.1 LAN Connection

- Unshielded RJ-45, 10/100Base-T, IEEE 802.3 Ethernet
- Line Connection: RJ-45

A.2 Transmission Line

Two-wire unconditioned twisted pair.

A.3 Multi-Rate Ethernet Extender Line Rate

16.67 Mbps, symmetric upstream/downstream. Additional symmetric and asymmetric rates are available via DIP switch settings:

- Symmetric Line Rates:
  6.25 Mbps, 9.38 Mbps, 12.5 Mbps, 16.67 Mbps
- Asymmetric Line Rates:
  4.17 Mbps/1.56 Mbps, 9.38 Mbps/1.56 Mbps, 16.67 Mbps/2.34 Mbps

A.4 Multi-Rate Ethernet Extender Distance

6,000 ft. (1.83 km) at 1.56 Mbps upstream/4.17 Mbps downstream

Note Distances depend on selected line rate.

A.5 Line Surge Suppressor

Gas tube with maximum current surge: 20 kA (8120 μs).

A.6 LED Status Indicators

- Power (Green)
- Line: Link (Green) & QOL (Red)
- Ethernet: Link (Green), Collision (Yellow), Duplex (Yellow), and 10/100M (Yellow)

A.7 Power Supply

Input power: 5 VDC, 1A

Power consumption: 560 mA at 5 VDC

External AC and DC options:

- AC: 120 VAC, 220 VAC, and UI (120–240 VAC)
- DC: 12 VDC, 24 VDC and 48 VDC

A.8 Temperature Range

32–122°F (0–50°C)

A.9 Humidity

Up to 90% non-condensing.

A.10 Dimensions

1.58H x 4.16W x 3.75D in. (10.6H x 4.1W x 8.8D cm)

B. Multi-Rate Ethernet Extender Interface Pin Assignment

B.1 10/100Base-T Interface

RJ-45

- Pin 1: TX+/RX+
- Pin 2: TX-/RX-
- Pin 3: RX+/TX+
- Pin 6: RX-/TX-
- Pins 4, 5, 7, 8: no connection

B.2 Line Interface

RJ-45

- Pin 4: RING
- Pin 5: TIP
- Pins 1, 2, 3, 6, 7, 8: no connection

C. Distance Chart, Based on 24 AWG (0.5 MM)

Symm Line Rate (DS/US)	Distance in feet (km)
6.25 Mbps	4,500 (1.37)
9.38 Mbps	4,150 (1.26)
12.5 Mbps	4,000 (1.22)
16.67 Mbps	3,300 (1.00)

Asymm Line Rate (DS/US)	Distance in feet (km)
4.17 Mbps/1.56 Mbps	6,000 (1.83)
9.38 Mbps/1.56 Mbps	5,500 (1.68)
16.67 Mbps/2.34 Mbps	5,000 (1.52)

Note DS/US = Downstream/Upstream.

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